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BEE KEEPING IN FLORIDA.*

By FRANK STIRLING

The keepers of bees in Florida find many reasons for engaging in this industry. Some engage in it solely for the honey produced and the financial gains resulting therefrom, while others, in fact a large majority, are in the business for the love of it. For some it is a recreation, and there is none better, as it gives delightful and absorbing occupation in the open air, and those who love natural science find no more fascinating problems than the ones still unsolved in the hive.

As a vocation it requires one's whole time and energy in order to insure success. Florida already has a large number of persons engaged in the bee industry whose yearly incomes vary from $500 to $5000. You will find bee keepers located in most all sections of the State, but most of them are at points where the pasturage for the bees is of the best; that is, where the plants grow which produce the most and best honey, such as the citrus grove sections on the east and west coasts, the swamps where great quantities of cabbage palmetto grow, and the northwestern portions of the State where the tupelo and titi abound. Some bee keepers in Florida have several hundred colonies, but most of them keep only a few as a "side issue". Fifteen or twenty colonies may be managed with comparatively little time and attention, and if proper care be given to such an apiary it will prove profitable. If the season is favorable the product of one colony should net the owner from $4.00 to $10.00. For example, three years ago, from a small apiary of thirty-two colonies, the writer produced one ton of honey which sold at from ten to twenty-five cents per pound. It is not considered an exception for some colonies to produce as much as one hundred pounds of surplus honey during one year.

*Paper read before the Florida Entomological Society.

Of all the lower animals, bees are the most highly developed in certain ways, especially with regard to the spirit of communism, which is wonderful. One of the most remarkable peculiarities of bees, which is also shared by social insects such as ants, wasps and termites, is that there are three distinct kinds of individuals in the community, for in addition to the males and females which are the reproducing members of the colony, there is a third class which performs the labors of the community. These, commonly known as workers, are really undeveloped queens or unsexed females. In the termites the workers are both females and males.

The queen bee is the acme of a long period of development. She may actually be the mother of all her subjects. Too much care cannot be given to the selection of the queen, or mother bee, of the colony, for her blood is in their blood, her faults their faults, and her weaknesses their weaknesses. The mature or laying queen is a very graceful insect, her body is long and pointed and extends far beyond the tips of her closed wings. It requires about fifteen days for her to emerge from her cell after the egg has been laid. After several days she mates with a drone outside of the hive high up in the air on what is known as the "flight". During her life, which is sometimes less than a month, but generally two or three years, and occasionally more than five years, she mates with a drone only once.

Of all the inmates of the hive, the lot of the drones is the least enviable, for the reason that one only will fulfill the destiny as father of the hive; many are born only to be slain when the honey harvest is low. In appearance, the drone differs much from the queen and the workers. He is broad and the rear end of his body blunt. He is made for a life of idleness, his hind legs bear no pollen baskets, his tongue is so short that he could not reach the nectar inside the blossoms even if he wanted to do so, and he has no wax glands such as the worker has for secreting wax, and he cannot fight his enemies because he has no sting. His only accomplishment is his buzz. He generally lives until the workers decide they cannot afford to keep him any longer. In a queenless colony he may live six months.

In the bee community all the work is carried on by neuters, or unsexed females. The life history of the worker is usually as follows: The cell in which she is developed is the smallest of

those composing the honeycomb. In twenty-one days from the time the egg is deposited the worker emerges a fully developed bee ready to do the work of tending the larvae, gathering pollen and nectar from the field, and also acting in the capacity of guardian to the hive. The life of the worker during the busy season is usually about six weeks. However, those born in the late fall live through until the following spring. Very few die in the hive, especially during the busy season, as their wings wear out while flying to and fro and they drop to the ground. They apparently never rest when there is a good flow of nectar from the flowers, for during the day they are engaged in gathering the harvest, and all night long they work in the hive secreting wax, which is necessary to build the honeycomb; and by keeping a constant circulation of air thruout the hive by means of their wings, they evaporate the moisture from the sweetened water, which is known as nectar, until nothing is left but the honey. In other words, while the bees gather nectar, they make the honey.

In these troubled times, when we are all urged to do our "bit" ("best") in the great struggle for universal peace, when the farmer especially is asked to make his acres produce their maximum, there is nothing that can add to the general supply more than almost any kind of sweetening.

The production of honey, bee keeping, has always been quite an industry. Long before the dawn of history honey was used and prized highly as food. This valuable sweet, to the ancients of our race, was a perfectly concentrated sweetening ready for immediate use without any preparation. The first mention of this ready-made sweet in history is in Genesis, fourteen, eleven. "Take of the best fruits in the lands in your vessels, and carry down the man a present, a little balm and a little honey."

One who is well versed in the science of bee keeping, while traveling through the State of Florida, may see the enormous waste of the thousands of acres of flowers of numerous kinds. What I mean is that just about one per cent of the nectar produced by these flowers is being harvested by the honey bees. The census reports but $100,000.00 worth of honey produced annually in Florida, and there could easily be $1,000,000.00 worth produced if enough bees were on the job and handled properly by competent bee keepers.

Wild bees are common and the cutting down of bee trees with

their stores of honey is not infrequent. Several years ago I cut down four bee trees during one morning, securing therefrom about one hundred pounds of honey. If bees do so well wild, it is certain that by intelligent effort the honey production here in Florida could be made profitable. In California, where conditions for honey making are no better than here in Florida, in my opinion not nearly so good, there were produced in 1915, 600 car loads, or 15,000,000 pounds.

Most people have the idea that honey can be used only as syrup or in the comb to be eaten raw. Experts in nutrition in the United States Department of Agriculture have gone fully into the subject, and declare that with butter at forty cents a pound, a pound of honey at seventeen cents will be found equally economical as a source of energy. You can get the Department's Bulletin No. 653 entitled "Honey and Its Use in the Home", which is free, by writing to the U. S. Department of Agriculture at Washington. Information can also be secured from Wilmon Newell, Plant Commissioner, Gainesville, Florida, who has had a wide experience in bee culture.

Bees serve a good purpose besides the production of useful food. They are essential to the proper pollination of fruit trees. It is a well known and long established truth that the nectar, odor and bright color of the flowers are simply means of attracting insects in order that the fertilizing pollen may be carried from flower to flower. The honey bee is chief among insects for this purpose. It is the most easily controlled of all insects to do this necessary work.

It is of interest to know that Florida holds the world's honey producing record. In support of this claim I will quote from a report by P. J. Wester, formerly horticulturist of the U. S. D. A. Plant Introduction Station at Miami but now horticulturist of the Philippine Bureau of Agriculture, as follows: "It is worthy of note that the world's record for honey production is held by the sub-tropical state of Florida. The 103 colonies of an apiarist there, known to the writer, averaged about 298 pounds of honey per colony one year, and one produced the astonishing amount of 496 pounds."

The average yield per colony for Florida for 1917 was 86 pounds, which was almost twice the amount per colony produced in most of the other states during the same year. So the man in Florida who has a hive of bees, especially at the present time, is not likely to get "stung".

THYSANOPTERA OF FLORIDA

J. R. WATSON
Agricultural Experiment Station

These insects are usually called thrips. They are all small, the largest measuring about eight millimeters (1/3 in.) in length while the smallest is scarcely half a millimeter. The vast majority are from one to two millimeters long. This is not as great a range in size as is common in other orders of insects. They are slender insects and their bodies are composed of four movable parts—the head, prothoraz, pterothorax (fused meso- and meta-thorax), and abdomen. This mobile structure enables them readily to squeeze into cracks in the bark of trees and into the parts of flowers where most of them live. Moreover the ten joints of the abdomen are loosely articulated so that the abdomen, like that of rove beetles, can be bent up over the back in a threatening manner as if the insect would sting. The real object of the motion is, in most cases, to straighten out the hairs of the wings preparatory to flight.

Each of the four parts of the body bears appendages. On the head are the antennae, always long and slender and composed of from seven to nine segments and capable also of a large range of motion. The comparative lengths of these antennal segments are much used in classifying thrips. On the antennae are hairs and spine-like organs. Some of these are "sense cones", probably organs of smell and perhaps of hearing.

Large compound eyes are present and near them usually three small simple eyes, ocelli. The anterior one of these frequently is directed forward and the others upward.

The mouth parts are of the sucking type and not rasping as is sometimes stated. However, the punctures they make in the tissues attacked are usually numerous and close together, giving to the injured tissues somewhat the appearance of having been rasped away. A peculiar characteristic of the mouth parts is the lack of symmetry between the two sides. The right mandible is entirely missing.

Although some species are wingless, there are usually two pairs of similar wings. Each consists of a long and rather narrow membrane fringed with very long hairs. These hairs are responsible for the name Thysanoptera, "fringe wings". In

many species there are from three to twenty or more hairs of a second row present near the end of the front wings.

The body is usually provided with a few stout hairs or spines. These are most numerous towards the end of the abdomen but many species have prominent ones on the angles of the thorax and often a long stout one (post-ocular) some distance behind each eye.

The legs end in peculiar expansile membranes which are responsible for an older name of the order, Physopoda, or "bladder-feet".

There are two quite different types of ovipositors, a long saw and a softer membranous tube. Those thrips having the latter type are placed in the sub-order Tubulifera. Those having the saw in the sub-order Terebrantia and in the family Æolothripidae or Thripidae, according to whether the ovipositor is turned up or down.

This order of insects is most closely related to the true bugs, Hemiptera, and was formerly placed in that order.

HABITS. Most species are plant feeders. They suck the sap from the more tender parts of the plants. Some are predatory on other small insects and mites. One of our Florida species—may his tribe increase—feeds on the eggs and crawlers of white-fly. All thrips are of potential economic importance.

LIFE HISTORY. As a typical life history we may give that of our most common species, the Florida Flower Thrips. The eggs are laid in the tissue of tender plants just below the surface in a shallow slit made by the female. They hatch in about three (2-4) days. The larvae feed and grow for an average of 15 days (the minimum was ten and the maximum 24 days in summer), molting three times. The last immature stage is the pupa. This is peculiar. Like insects with a complete metamorphosis, thrips do not feed during this time and move about but little. But like their relatives, the bugs and other insects with an incomplete metamorphosis, the wing pads are present during this stage. Their development is thus intermediate between the two types. A final molt and the adult appears full-winged and with fully developed reproductive organs. The females feed for about five days and then begin to lay eggs. The completed life history therefore covers about 23 days. This would allow 16 generations per year. But breeding ceases altogether during the coldest weather of our winter and pro-

ceeds much more slowly during the entire winter. There is not a month of the year, however, during which breeding is entirely suspended. After a warm spell in even January one can find at least a few young in roses and other favorite flowers. They do not hibernate, but are equiescent during the coldest weather. Further north thrips hibernate in either the adult, egg, or larval stages.

Parthenogenesis is common. Indeed in many species no males have ever been seen.

ENEMIES. Thrips seem to be exceptionally free of predaceous enemies. They are apparently too insignificant to figure in the commissary arrangements of other animals. An internal parasite has been recorded, a hymenopteron, but it is not common. A fungus disease or two have been observed, and a small bug *Triphleps insidiosus,* feeds on them. But the chief factor in keeping down their numbers is heavy dashing rain, which beats them from the plants and pounds them to death on the ground.

This order of insects has been but little studied by resident entomologists of Florida. Mr. A. C. Morgan of the U. S. Bureau of Entomology, has done considerable collecting in the State, aided by Mr. Runner, and has described several species. Mr. J. D. Hood of the U. S. Biological Survey, has described several Florida species.

Prof. A. L. Quaintance and the late H. M. Russell, both of the Bureau of Entomology, have studied some species of economic importance. The writer has collected in this group only incidentally while working on some species injurious to plants of economic importance. The present list includes all the species the writer has collected in the State with the exception of two or three apparently new species of which he has not as yet been able to collect sufficient material for description. There has also been included in this list all the species that have been listed by other collectors as taken in the State. Many of these specimens the writer has not seen, and he assumes no responsibility for the correctness of their identification. But as they have all been listed by careful workers, they are doubtless mostly correctly identified. Those records that have thus been compiled from the publications of others are indicated in the text with the name of the collector and a reference to the publication in which the collections were recorded. When the name of the col-

(Continued on page 65)

The

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PROF. J. R. WATSON.....Editor
DR. E. W. BERGER.....Associate Editor

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EXTERMINATE THE BOLL WEEVIL

A late number of the Quarterly Bulletin of the State Plant Board bears an editorial of unusual interest to entomologists. In brief the suggestion is to exterminate the boll weevil from the United States by enacting a "no cotton" year. From the entomological side the problem is an easy one. The difficulty is psychological. To tell a man that he cannot raise cotton interferes with his "rights". But, as the Commissioner pointed out, by the time the war is over we will have been so thoroly "Hooverized" and "McAdooized" that we will not think so much of our "rights". The fact that the suggestion comes from the man who has practically "canned" Citrus Canker (seems as if it should be spelled Kanker to link it to other undesirables) will give the suggestion weight. Should a few plants of cotton escape the inspectors and leave a few colonies of the weevils, their extermination will be an easy matter as compared with that of Citrus Canker.

Our members will be glad to read in this issue of the continued prosperity of the Lee County Branch.

NOTES BY THE SECRETARY TREASURER

The annual dues of the Society were raised to one dollar, beginning with 1918, at the March meeting of the Society. This increase was made necessary in order to have a reserve fund available for the publishing of THE BUGGIST, in case other income should at any time prove insufficient. Each issue of THE

BUGGIST costs between twenty-five and thirty-five dollars. It is planned, on the other hand, to enlarge each issue as funds become available.

It is therefore urged that all members who have not already done so, be so kind as to send in their dues at once. In order to save postage and thereby to conserve the funds of the Society for use in publishing THE BUGGIST, personal notices for the annual dues will not be sent except when necessary. Please do not make this necessary in your case but send your dollar before you forget it. Receipts for dues will also generally not be mailed, but will be acknowledged in the next number of THE BUGGIST.

New members will also be notified of their election in THE BUGGIST under Reports of Meetings.

The Secretary-Treasurer also wishes to urge upon all members to miss no opportunity to obtain new members, and upon all others who read this notice and are interested in "bugs" to become members.

The Executive Committee has designated the Curator of the University Museum as Custodian for publications received in exchange and otherwise.

REPORTS OF MEETINGS

(All meetings are held in Dr. Davis' Lecture Room, Science Hall, University of Florida, from 4:30 to 6:00 p. m., unless otherwise stated.)

At the meeting of December 17, 1917, a communication from Mr. Roy Thompson, Secretary of the Lee County Entomological Society, was read. In this letter application was made for accepting this Society as a branch of the Florida Entomological Society. As the constitution would need amendment to provide for such affiliations, the Executive Committee was instructed to draw up the proper amendment.

The following new members were elected: C. E. Whittington, W. L. Benedict, J. L. Shelton, P. F. Robertson, R. G. Oliphant, Roy Thompson, A. H. Andrews and F. S. Balentine.

The paper of the evening, "Entomology as a Pure Science", was read by E. W. Berger. It was the aim of this paper to show that all modern scientific achievements had their beginnings in pure science, or the investigation of natural phenomena for

the sake of learning, understanding them as such regardless of what the practical bearing might be. This is also true of entomology, and for that reason the investigation and study of insects as such, regardless of their injury or usefulness, should not be lost sight of. It is planned to publish this paper in a future number of THE BUGGIST.

At the meeting of Jan. 28, 1918, the Executive Committee, in pursuance of instructions received at the December meeting, recommended the following amendment to the Constitution of the Florida Entomological Society. This amendment was adopted by vote of the Society:

> Article 9.—Ten or more members resident in any locality, or having a common interest in Entomology, subject to the approval of the Executive Committee, may form a branch of the Florida Entomological Society. Branches shall have the power to perfect their organization, hold meetings, and in general have full control over their affairs, providing they conform to the constitution and regulations of the Society. All members of branches must be included in the membership of the Society.

It was further voted, upon recommendation by the Executive Committee, that the Lee County Entomological Society be accepted as a branch of this Society. A list of the members of this branch was published in the winter number.

The following officers were elected for the ensuing year: President, Dr. H. S. Davis; Vice-President, F. M. O'Byrne; Secretary-Treasurer, E. W. Berger; member of Executive Sommittee, Dr. J. H. Montgomery.

The following were re-elected on the Editorial Staff of THE BUGGIST: Editor, J. R. Watson; Associate Editor, E. W. Berger; Business Manager, K. E. Bragdon.

It was voted that, at the end of a year, those not having paid their dues for the preceding year be notified, and if they do not pay, be automatically dropt from the membership of the Society.

It was voted that instead of notifying non-resident members

of each meeting, the Executive Committee prepare programs three months in advance and publish them in THE BUGGIST.

Mrs. E. G. Rose of Wauchula, and O. K. Courtenay of Gainesville, were unanimously elected as members of the Society.

Under "Timely Notes", Professor J. R. Watson showed beetles of the Family Brenthidae occurring in South Florida. These are close relatives of *Cylas formicarius*, the Sweet Potato Root Weevil.

This being the date for the annual election of officers, the principal paper of the evening was omitted.

At the meeting of February 26th, Prof. John Schaffner of O. S. University, Columbus, O., and Mr. Frank Steffen of Emporia, Kan., were present as visitors.

It was voted to hereafter hold the regular monthly meetings of the Society on the fourth Monday of each month instead of the third, it having become apparent that there would generally be less routine work at that time to keep resident members from attending.

The following new members were elected: Geo. G. Ainslee, Knoxville, Tenn., Entomologist Bureau of Entomology, U. S. D. A.; R. L. Clute, Extension Entomologist Stored Products, Insects, Gainesville, Fla.; W. Knaus, Editor and Manager, the *Democrat-Opinion,* McPherson, Kansas; M. V. Millington, Tampa; John A. Clinger, Tampa; and Jesse F. Taylor, Seffner, Fla.

Under "Timely Notes", Mr. K. E. Bragdon showed specimens and reported on the finding of the Banana Root Weevil *(Cosmopolites sordidus)* at Larkin, Fla. This is the first record of its occurrence in Florida, and the infestation is believed to have been eradicated. E. W. Berger briefly reported on the Avocado Weevil *(Heilipus lauri)* and showed specimens. Altho this insect is not known to occur in Florida, the possibility of its introduction from Mexico and Central America is dreaded and the Port and Railway Inspectors of the Plant Board are keeping a keen lookout for it.——Prof. J. R. Watson reported seeing two more specimens of the Mourning Cloak Butterfly *(Vanessa antiopa)* near Gainesville in February, having previously reported collecting a specimen in January, 1917.

The paper of the evening, "Insect Photography," was read by Dr. H. S. Davis and discussed by those present. Dr. Davis explained the use of colored screens interposed before the object to be photographed. The purpose of these screens is twofold: (1) to intensify certain colors and to subdue others, in order to bring out their relative values as they appear to the eye; (2) to eliminate certain colors altogether. This is necessary because photographic plates are not equally sensitive to all colors. A yellowish or light brown color, for instance, will ordinarily photograph black, but by interposing a screen of that color, and giving a longer exposure, its proper value will be given in the photograph. However, to use screens successfully, plates sensitive to several colors, or all colors, are necessary, such as Ortho, Iso, and others. The use of the new Pan-chromatic plates, sensitive to all colors, was explained and illustrated by a diagram of the spectrum. That the slower plates give better results for photographing specimens in the laboratory than the very rapid ones so generally used, was also emphasized.

March 25. It was voted to increase the annual dues of the Society from 50 cents to $1.00, beginning with 1918. Of all members who voted, non-resident as well as resident, only one non-resident member voted against the increase.

Under "Timely Notes" Mr. Frank Stirling reported on the rearing of 20 Tachina Flies from the caterpillar of a tiger moth collected at Gainesville. He also reported collecting the grubs and adults of a 11-lined beetle *(Leptinotarsa undecimlineata)* feeding on wild eggplant at Havana, Cuba, in January, 1918. This beetle is a close relative of the Colorado Potato Beetle *(Leptinotarsa decimlineata)*, so common in the north and also occurring in the northern tier of counties of Florida.—— Messrs. Dozier and Van Hyning reported obtaining some nematode worms from katydids.

The paper of the evening, "Ecology of Hammock Insects," was read by Mr. Dozier. The discussion was led by Prof. Watson, followed by others present.

The Society adjourned at 6 p. m.

April 29. Visitors present were Prof. C. L. Willoughby of the University and Mr. Leland of the University Farm.

It was voted to sever the Society's connection as a section of the Florida Academy of Sciences and continue as an independent organization.

The principal speaker of the evening being absent, Mr. A. L. Swanson was requested to give a brief account of the inspection of the Florida Keys for the Plant Board. Mr. Swanson stated that he and his crew lived on a house-boat and that the inspection was made between January 8 and April 19, 1918, extending from Elliott's Key, on the north, to Key West. Mr. Swanson further stated that the growth on the Keys is mostly hardwood, including the Gumbo-Limbo. Most of the land is cut-over and the largest trees measure 12 to 18 inches in diameter. The larger insects appeared to be absent, at least at this time. Cabbage butterflies and the Orange Dog were seen, the latter in January at Key West, the insect fauna has many representatives from the West Indies. Many plantings of cotton, etc., were seen without a blemish, being absolutely free from insects and diseases, a condition he had never seen before.

Under "Timely Notes" Mr. O'Byrne reported that birds appeared to get many of the cutworms in his garden; or did wasps get them?——E. W. Berger reported that the whitefly was becoming unusually severe in the citrus groves, due to the fact that the trees had not been defoliated by the last winter's freezes.

May 27. At this meeting Prof. W. L. Floyd, of the University, and Mr. Geo. B. Merrill were present as visitors.

The following new members were unanimously elected: Mr. B. L. Boyden, Scientific Assistant, Bureau of Entomology, stationed in Florida on the Sweet Potato Weevil work; Mr. J. E. Graf, Bureau of Entomology, in charge of Sweet Potato Weevil work in the Southern States; and Mr. Geo. B. Merrill, Deputy Port and Railway Inspector for the Plant Board.

Under "Timely Notes" Mr. Stirling described an infestation of Cottony Cushion Scale, near Sarasota, as the worst he had ever seen. Groves that were infested last year now had but small amounts of scale, with indications that the Vedalia cleaned it up.——Prof. Watson exhibited specimens of the Broad-nosed Grain Weevil, collected at Plant City by E. A. Back, of the Bureau of Entomology, in corn. He also referred to the occurrence of this same weevil as severely infesting dasheens at

Brooksville, the dasheens having been stored near some corn severely infested.——E. W. Berger reported an early and unprecedented demand for the Red Aschersonia, or Red Whitefly Fungus.——Prof. Carl J. Drake briefly discussed a new species of Lacebug (tingid) and showed specimens. He also briefly reported on some of the parasites of the Green Pumpkin Bug.

The principal paper of the evening was by Prof. Carl J. Drake, of Syracuse University, N. Y., on "Water Hemiptera" (Water Bugs). Prof. Drake showed a number of live specimens and gave brief accounts of their habits. He stated that, while these insects are not generally of economic importance, some feed on fish and are therefore injurious to the food supply. In species of Belostoma, the Electric Light Bugs, the male carries the eggs of the female on his back.

The second paper of the evening was by Mr. K. E. Bragdon on *"Euscepes porcellus"*, a snout beetle very similar to *Euscepes batatae*, the West Indian Sweet Potato Weevil. In his search for the latter near Moor Haven, he found the former infesting the Moon Vine, a morning glory. Porcellus has been reported as injuring sweet potatoes in Jamaica but not known to do so in Florida. Batatae is not known to occur in Florida.

NOTES FROM THE LEE COUNTY ENTOMOLOGICAL SOCIETY

(Branch of the Florida Entomological Society)

During the past quarter the Lee County Entomological Society has held its regular weekly meetings on Tuesday evenings. During the early part of the quarter the society had as its guest Dr. J. H. Montgomery, who gave a very interesting and helpful talk on the Spiny Citrus Whitefly *(Aleurocanthus woglumi*, Ashby).

On Thursday evening, Jan. 17th, W. L. Benedict treated the society to a stag dinner at the Hotel Elton. The affair was given in honor of R. G. Oliphant, who was shortly to leave on an inspection tour of the Florida Keys conducted by the State Plant Board.

Stanley Millege has been transferred to Citra, Fla., where he will continue his work as inspector for the State Plant Board.

At the February 5th meeting the present officers were re-elected to serve during the coming quarter. The officers are: Shirley B. Walker, Pres.; Fritz Fuchs, Vice-Pres.; Roy Thompson, Sec-Treas.

The return of Fritz Fuchs to his home at Redland, Fla., is viewed with deepest regret by all who knew him. Mr. Fuchs was a hard and enthusiastic worker and his departure is a distinct loss to the society.

Orange aphids are unusually abundant in the vicinity of Fort Myers this spring and we may look for some little damage on their account.

The orange sharpshooter is also causing some damage here.

PERSONALS

Mr. C. E. Wilson, formerly Assistant Entomologist to the Plant Board, has been appointed Neural Histologist in the Brain Surgery Department, U. S. A. Medical Corps. He will be engaged in research work in France.

Mr. A. C. Mason, formerly connected with the Station and Plant Board, is now in the U. S. Army Hospital Service.

Mr. K. E. Bragdon, who has done such valuable work for the Society as Secretary-Treasurer and for THE BUGGLST as Business Manager, has been obliged on account of his official duties to resign both positions. It is largely this that is responsible for the delay in publishing THE BUGGIST.

Prof. Carl J. Drake, Associate Professor in Entomology in the School of Forestry of Syracuse University, has been employed for the summer to assist in the Entomological Department of the Experiment Station. He is working on the life history of the Southern Green Stink Bug or "Pumpkin Bug" *(Nezara viridula)*.

Among the welcome additions to entomologists of Gainesville is Prof. Fatig, who has come from Dakota to take charge of the work of the State agricultural schools. He has a large collection of hymenoptera and diptera.

Luther Brown, agent State Plant Board, enlisted in the U. S. Navy Hospital Service on March 18.

A. C. Brown, agent State Plant Board, enlisted in the National Army on April 4th.

F. F. Bibby, Assistant Entomologist State Plant Board, enlisted in the U. S. Naval Hospital Service on April 10th.

Wilmon Newell, State Plant Commissioner, Gainesville, Fla., is State Leader of the Sweet Potato Root Weevil Control and Eradication Work.

J. E. Graf, of the Bureau of Entomology, U. S. D. A., is in charge of the Sweet Potato Root Weevil Work for the South.

O. K. Courtenay, U. S. Bureau of Entomology, is Field Agent in charge of the Sweet Potato Root Weevil Control and Eradication Work.

K. E. Bragdon, Deputy Port and Railway Inspector, State Plant Board, is Acting Field Agent in the Sweet Potato Root Weevil Control and Eradication Work.

H. L. Dozier, Entomological Assistant at the Experiment Station, has enlisted in the Hospital Service of our country.

Mr. R. N. Wilson, until recently Farm Demonstration Agent of Palm Beach County, has accepted a similar position in Riverside County, Calif. Florida has lost a good scientist and a valuable citizen.

Dr. E. A. Back, In Charge of Stored Products Insects, and Mr. Walton, In Charge of Cereal and Forage Crops, both of the Bureau of Entomology, were recent visitors to the State.

Mr. Thomas H. Jones, Agent of the Bureau of Entomology, was recently in Florida looking over the ground with a view to establishing a substation for the investigation of truck crop insects.

BULLETIN NOTICES

"The Silverfish," by E. A. Bach, Farmers' Bulletin 902, will interest everyone who owns a book in Florida.

A 100-page bulletin on Citrus Insects, a companion piece to the bulletin on Truck Crop Insects, has been published by the Experiment Station.

WANTED—Diurnal Lepidotera of Florida in exchange for desirable western species. Dr. John A. Comstock, 321 South Hill St., Los Angeles, California.

THYSANOPTERA OF FLORIDA

(Continued from page 55)

lector is not indicated, the collection and identification are those of the writer.

This should be considered as preeminently only a preliminary list and by no means complete. It is thought, however, that it includes all species that have been recorded in entomological literature as occurring in the State. The only locality in which the writer has done systematic collecting is that about Gainesville, and even this small area is by no means exhausted.

Nevertheless the list contains more than four times as many species as Smith lists in his "Insects of New Jersey". When one considers that in most orders of insects the New Jersey list is much larger than the corresponding one of Florida (not because New Jersey has more species but because it has been more thoroly worked than Florida), it becomes evident that Florida is rich both in species and individuals as compared with states further north.

In addition to notes on the distribution, food plants, season, and habits of our Florida species, this list contains keys to the species in general to which the author has added new species. This seems desirable because no adequate keys are in existence. These keys have in most cases been modified from those of other authors and unless otherwise indicated from Moulton (1911). There has been appended bibliography of those works found most useful in the study of our Florida species and all papers in which Florida captures have been recorded. Any one wishing to identify our species for himself should be able to do this by means of this list and Moulton's work (see. bibliography, Moulton, 1911).

FAMILY AEOLOTHRIPIDAE

1. *Æolothrips floridensis* Watson. (Watson, 1916.)
   Gainesville, April 1913, on oats. Mar., 1915, on oats and corn. A comparatively rare species has been taken a few times on oats and corn always associated with the next species.

2. *Æolothrips bicolor* Hinds. (Hinds, '02.) The Black and White Cereal Thrips.
   Quincy, 1915, on oats (Hooker, '07); March, '09, collected by H. F. Wilson on *Plantago virginica*, corn, onions (Morgan, '13); May 14, 1909, on rutabaga (Morgan, '13).
   Gainesville, April 23, 1914, on oats; Mar., 1915, on strawberries and citrus.

This is our common cereal thrips and is often abundant on oats in the spring and damages them materially.

3. *Franklinothrips vespiformis* (Crawford). (Crawford, '09.)
Orlando, late February to summer on leaves of citrus. *(Æolothrips vespiformis* Back, '12.)

FAMILY THRIPIDAE

4. *Thrips quinciensis* Morgan. (Morgan, '13.) THE QUINCY THRIPS.
Quincy, collected by A. C. Morgan and G. A. Runner on *Pinckneya pubens* Mx.

5. *Thrips spinosus* Morgan, (Morgan, 13.) THE MAGNOLIA THRIPS.
Quincy, May 1910. Collected by A. C. Mason and G. A. Runner in blossoms of *Magnolia grandiflora.*
Gainesville, May 1915-17, in blossoms of *Magnolia grandiflora.*
This thrips may be found quite abundantly in practically all Magnolia blooms and has been found nowhere else.

6. *Thrips tabaci* Lindeman. (Redescribed by Hinds, '02, p. 179.) THE ONION THRIPS.
Lake City, 1897-8. On onions, cabbage, cauliflower, and crabgrass *(Panicum sanguinale).* (Quaintance, '98.)
Gainesville, Nov.-June, on onions.
Generally distributed, probably in every onion field in the State, and does great damage every year. It is the most serious enemy of onions in the State. Affected onions are characterized by white blanched and dying tips. For remedies see Bull. 134, Fla. Ag. Exp. Sta. Cosmopolitan in its distribution.

7. *Thrips abdomalis* Crawford. (Crawford, '10, p. 157.)
Quincy, March '09. Collected from tobacco by H. F. Wilson; May 17, 1910, on *Senecio* by G. A. Runner and A. C. Morgan. (Morgan, '13.)
Key West, April 23, 1912. "Miscellaneous collecting" by G. A. Runner and A. C. Morgan. (Morgan, '13.)
Gainesville, Oct.-Nov., 1913, on *Solidago* and other composites.
Extends north to Maryland and Illinois, and west to Mexico.

8. *Plesiothrips perplexus* (Beach). (Beach, '95.) *(Thrips perplexus,* Hinds, '02.)
Quincy, Sept. 8, 1909, on grass. (Morgan ,'13.)
Extends north to Maryland and Iowa, and west to Texas.

9. *Heliothrips haemorrhodalis* Bouche. (Redescribed by Hinds, '02.) THE GREENHOUSE THRIPS.
Miami, Sept. 1915; 1908, collected by P. J. Webster on mango and avocado. (Russell, '09.)
Orlando, on foliage of *Acer rubrum.* (Black, '12.)
Gainesville, Jan. 28, 1913, in a greenhouse; May 1917, very destructive to *Coleus* out of doors.
In the northern states this insect is confined to greenhouses, hence the name. But in Florida it is common about gardens and ornamentals out of doors.

10. *Heliothrips rubrocinctus* (Giard). (Russell, '12.) THE RED-BANDED THRIPS. *(Physophus rubrocinctus,* Giard, '01, p. 263.)
Miami, collected in 1908 on mango *(Magnifera indica)* and avocado *(Persea gratissima)* by P. J. Webster (Russell, '12), Dec. 1914. July 1914, on mango.
This insect, introduced from the West Indies, is now abundant on mangoes about Miami, Ft. Myers (Dr. E. W. Berger) Frostproof and West Palm Beach.
It is a severe pest and causes the leaves to loose their color and ultimately to fall.

11. *Echinothrips americana* Morgan (Morgan, '13, p. 16.) THE SPINY THRIPS.
Quincy, Sept. '09 on *Magnolia grandiflora* and "Coffee Bean"; May 18, 1910, on Pokeweed. (Morgan, '13.)
Extends north to Missouri and Maryland.

12. *Limothrips cerealium* Haliday, '82. (Redescribed by Hinds, '02, p. 139.) (L. avena, Hinds.) THE CEREAL THRIPS.
Quincy, May '10, on oats. (Morgan, '13.)
Extends north to Massachusetts and Illinois; west to Texas and Kansas. In Europe also.

13. *Chirothrips crassus* Hinds '02.
Quincy, Oct. and Nov. 1915. (Hooker, 1907.)

14. *Chirothrips manicatus* Haliday ('76). (Redescribed by Hinds, '02 p. 134.)
Quincy, collected on oats on March 20, 1909, by H. F. Wilson. (Morgan, '13.)
Extends north to Massachusetts and Iowa; Oregon and British Columbia; Europe.

15. *Scolothrips 6-maculatus* Pergande ('91.) THE RED-SPIDER HUNTER.
Orlando, spring of 1909. "Found feeding on red-spiders on citrus and several weeds." (Back, '12.)
Winter Haven, April 1916. (Dr. E. W. Berger, Coll.)
Extends north to New York and Missouri and Wisconsin; Hawaiian Islands.

16. *Aleurodothrips fasciapennis* Franklin. THE WHITEFLY THRIPS.
Orlando, March and fall of 1909. (Back, '12.)
Gainesville, Oct. 2, 1912, on citrus leaves.
Feeds on whiteflies but is too scarce to be of much importance.

17. *Odontothrips phaleratus* (Haliday). *(Thrips phalerata,* Haliday.)
Quincy, on *Plantago virginica,* H. F. Wilson. (Morgan, '13.)

18. *Frankliniella fusca* (Hinds). *(Euthrips fuscus.* (Hinds, '02.) THE TOBACCO THRIPS. *(Enicotianae* Hinds, '05.)
Quincy, on tobacco 1905 (Hooker, '07); March 1909, on *Plantago virginiana,* tobacco and life-everlasting, H. F. Wilson collector; May, on peanuts and sorrel. (Morgan, '13.) Tobacco, cocklebur *(Xanthium glabratum),* dewberry, mustard and shepherd's purse. (Chittenden, '04).
Gainesville, April 23, 1914, on oats; Feb. 4, 1915, on turnips. March 1915, on strawberries.

Extends west to Texas; north to Massachusetts and Michigan and South Dakota. A common pest of tobacco.

In the original description Hinds states that the ocelli are smaller than the facets of the eyes. While this is true in many of the specimens collected at Gainesville, in others the ocelli are larger. This character is variable as is also the color and the presence of wings.

19. *Frankliniella floridana* n. sp.

FEMALE, *Measurements.* Total length 0.7 mm. Head, length 0.09 mm., width 0.13 mm.; prothorax, length 0.07 mm., width 0.17 mm.; mesothorax 0.19 mm wide; width of abdomen in widest place 0.20 mm.; antennae, segment 1, 21; 2, 29; 3, 37; 4, 40; 5, 36; 6, 45; 7, 11; 8, 13 microns.

Color of the body bright yellow with brown blotches in center of thorax. The posterior margins of the first abdominal segments very dark, forming five narrow conspicuous bands across the dorsal surface.

Head pale yellowish gray with a darker area about the ocelli; deeply retracted into the prothorax; anterior margin slightly rounded, bearing two moderately long and thick but pale spines, similar but smaller spines along the sides.

Eyes large, not protruding, deep red. Ocelli large, posterior pair separated from the eyes by more than the width of the ocelli; orange yellow bordered and nearly surrounded by deep orange crescents which are wider than the ocelli. These crescents are separated from each other by a space narrower than the crescents. *Mouth cone* long, narrow, reaching entirely across the prothorax. *Antennae* inserted so far below the margin of the head as to completely hide the first segment. First and second segments, all but the extreme apex and base of the third, and the basal halves of the fourth and fifth grayish yellow, a little lighter than the head, remainder dark brown, giving the antennae a distinctly ringed appearance. Spines on the basal portion few but moderately long, thick and heavy, dark colored. On the apical portion they are more numerous but pale, short and inconspicuous.

Prothorax oblong-oval in outline, anterior margin slightly and the sides markedly convex, surface obscurely reticulated, a large triangle in the center conspicuously outlined in dark brown, destitute of conspicuous spines.

Mesothorax widest, with sides and anterior margin strongly convex.

Metathorax with straight sides but diverging sharply posteriorly.

Legs moderately long and slender, yellowish-gray with the tarsi and a large spot on the femora brown.

Wings light gray with two dark bands across the basal third, 19 spines on the fore veins and 22 on hind; dark, thick, heavy; four near the base of the fore vein short, others long. Hairs on the margins long but few in number.

Abdomen short; sides of the anterior portion, first five segments, arched, of the remainder straight and sharply converging. Anteriorly the spines are short and inconspicuous, posteriorly rather short but heavy.

Described from several specimens taken from velvet beans *(Stizilobium)*, Gainesville, Fla., July 1918. Type in the author's collection. Male not seen.

This species is about the size of the California species *F. minutus* as given in the original description, but differs markedly in color, position of the posterior ocelli, length of the mouth cone, and other characters. It is a very distinct species.

20. *Frankliniella occidentalis* (Pergande.) (Redescribed by Hinds, '02, p. 152).
(Euthrips occidentalis Pergande, '91).
Dade City, May 12, 1910, on beans, collected by Hunter and Morgan. (Morgan, '13).
Manatee, March 1911, on mango, H. F. Schultz, collector. (Morgan, '13.)

21. *Frankliniella stylosa* Hood.
(Euthrips floridensis Morgan, '13, p. 5).
Quincy, on *Asclepias variegata* L and in blossoms of *Catalpa catalpa.* Morgan, '13.
Extends north to Maryland.

22. *Frankliniella bispinosus* (Morgan, '13.) THE 2-SPINED FLOWER THRIPS.
Described from Dade City where it was taken in blooms of *Yucca,* May 1910.
Gainesville on oats, April '14; roses, April 1912; blooms of compositae, Oct. 1913.
Miami, April 1916, on avocado blooms which it severely damages.

23. *Frankliniella bispinosus projectus* Watson (Watson, '15.) THE FLORIDA FLOWER THRIPS.
Gainesville, has been taken every month in the year in roses, and could be taken almost any day and in a great variety of blossoms, but mostly in those of an open structure. Our most common thrips. Begonia (Nov.), tomatoes (March-May), compositae (Oct.-Dec.), *Aesculus pavia* (Mar.), peaches (Jan.-Mar.), *Persea* (March), peas (April), petunias, roses, *Cornus floridensis,* wild plum (Feb.), *Cercis canadensis* (Feb.), cherry laurel (Feb.), citrus; Ft. Ogden, citrus; Gulfport, on sea grape *(Cocolobus floridana)* Oct. 1913; Dania, Ft. Lauderdale and Pompano, on tomatoes, Feb. 1913, White City.
Not usually found in blossoms with a tube but the petunia is an exception. Prefers light colored, white or yellow blossoms.
Certainly most and probably all, the insects that have been mentioned in the Florida literature as *Euthrips tritici* belong to this or the preceding variety. The writer has not seen typical *Euthrips tritici* from Florida, but has collected it as far south as Swannanoa, N. C., and has it from Atlanta, Ga., and Alvin, Texas. It is at once told from either of the above varieties by the second segment of the antennae which is asymmetrical. In both of the varieties there are on the dorsal surface of this segment, two prominent spines. In var. *projectus* in addition this segment is prolonged anteriorally on the dorsal side so as to project over the third segment. This is particularly marked in the male. In the female the segment is, in addition, very long.

24. *Bregmatothrips gracilis* Hood & Williams ('15).
Orlando, Nov. 5 and 8, 1914, C. B. Williams, collector.

25. *Pseudothrips inequalis* Beach ('96). (Redescribed by Hinds, '02, p. 146.)
Quincy, May 17, 1910, on *Senecio.* (Morgan, 13.)
Gainesville, Nov. 1913, on wild Begonia.
Extends north to Maryland and Iowa.

26. *Heterothrips arisaemae,* Hood. THE INDIAN-TURNIP THRIPS.
Quincy, March 1909, on honeysuckle and *Rhodendron ulmiflorum,* H. F. Wilson, collector. (Morgan, '13.)
Extends north to Virginia and Illinois.

27. *Heterothrips aesculi* Watson ('15). THE BUCKEYE THRIPS.
Gainesville, Mar. 1914, April 1915, in blossoms of *Aesculus pavia.* Very common in blossoms of this plant.

KEY TO NORTH AMERICAN SPECIES OF HETEROTHRIPS

I. Prothorax twice as long as the head; antennae with apparently nine segments.
  a. Antennae without circles of distal sensoria on segment 4.
    b. Segment 3 light yellow, palest at the base; segment 4 brownish, palest toward the base; articulations of segments brown, not clear; wings brown, paler at base. Anterior femora shading to yellow at apex; fore tibiae yellow, shaded with brown laterally; tarsi yellow....*H. salicis* Shull.
    bb. Segment 3 yellow with white bands; segment 4 yellow to brown, lightest at the apex; some articulations brown, others clear; wings brown with a broad white band near the base. Anterior femora shading to brownish yellow at the apex; fore tibiae brownish yellow; tarsi brownish yellow. .....*H. aesculi* Watson.
  aa. Antennae with distal circles on segment 4; segments 1 and 2 slightly lighter than the body, shaded laterally with black; segment 3 light yellow, with a narrow sub-basal white band; distal third shaded with brown; segments 4-9 uniform light blackish brown except band of sensoria on segment 4. Wings blackish brown with a broad white band near the base. Legs concolorous with the body except tarsi and distal part of fore tibias which are yellow. .....*H. arisaemae* Hood.

II. Prothorax less than twice as long as head.
  a. Antennae with apparently ten segments; circles of sense areas on segments 4 and 5 (corresponding to segments 3 and 4 of other species of Heterothrips) light yellow; all others dark brown. Wings light brown, basal one-sixth clear. *H. decacornis* Crawford.
  aa. Antennae with nine segments.
    b. Posterior margins of abdominal tergites not fringed with scales.
      c. Abdomen not pubescent .....*H. borinquen* Hood.

cc. Abdomen closely pubescent; thorax finely striate.

d. Third antennae segment about 3.6 times as long as greatest width, grayish yellow. *H. analis* Hood.

dd. Third antennal segment less than 3 times as long as wide; pale yellow with orange pigment. *H. vitis* Hood. (Hood 1916.)

bb. Posterior margins of abdominal tergites 1-7 fringed with chitinous scales *H. pectinifer* Hood.

FAMILY MEROTHRIPIDAE

28. *Merothrips Morgan* Hood.
Pine Key, Jan. 1914. Found by Mr. R. C. Shannon in shell and debris. Taken by Mr. John B. Henderson.
Extends north to Maryland and Illinois.

FAMILY PHLOEOTHRIPIDAE

29. *Anthothrips niger* Osborn. (Redescribed by Hinds '02, p. 188.)
Quincy, 1905, on oats, wheat and tomatoes (Hooker, '07); March-May on *Plantago virginica*, rye, corn, rutabaga, oats, tomatoes, cocoa-grass. A. C. Morgan and H. F. Wilson. (Morgan, '13.)

30. *Anthothrips dozieri* n. sp.
♀.—*Measurements.* Length 1.5 mm. Head, length 0.187 mm., width 0.187 mm.; prothorax, length 0.16 mm., width 0.267 mm.; mesothorax, width 0.31 mm.; abdomen, width ———; tube, length 0.126 mm., width at base 0.069 mm., at the end 0.035 mm.; antennae, segment 1, 24; 2, 46; 3, 53; 4, 53; 5, 51; 6, 37; 7, 29; 8, 27 microns; total length 0.312 mm.

Color uniformly dark reddish brown except segments 3-6 of antennae. Legs 3-5 yellow, base of 6 yellowish-brown, apex light brown. Eyes reddish brown.

Head square; cheeks slightly arched and somewhat converging posteriorly. Ocelli large, posterior pair situated well forward, opposite the anterior third of the eyes whose margins they nearly touch, concolorous with the eyes. Mouth cone rather long and acute, reaching nearly to the posterior border of the prothorax. Post-ocular spine short and slender, tipped with a small and almost colorless but distinct knob as are all the spines on the anterior part of the body.

Antennae 8-segmented; segments rounded, the fourth somewhat thicker than the others. Sense cones and spines short, light-colored, and inconspicuous.

Prothorax wider than long, sides arched and converging markedly anteriorly; knobbed spines on both the anterior and posterior angles short.

Mesothorax somewhat wider, sides nearly parallel. One large, knobbed spine along the margin opposite the base of the wing. Other spines small and not knobbed.

Legs short and slender, weak, fore femora not thickened.

Wings well developed. Membrane reaching three-fourths the length of

the abdomen; decidedly constricted in the middle. Hairs of the fringe long and nearly equal in length; seven of a second row present.

Abdomen swollen posteriorally. Rather long spines on the posterior portion, not knobbed. Tube tapering markedly, its length exceeded by six of the longer terminal spines.

Described from a single female.

Collected from Hop Hornbeam *(Ostrya virginiana)* by beating, Mar. 1917, by H. L. Dozier.

Type in the author's collection.

In the author's key (Entomological News, XXVII, p. 129) this species goes to *A. Flavipes* Jones, but it differs markedly in its size, relative length of antennal segments, and the color of the antennae and tarsi.

KEY TO NORTH AMERICAN SPECIES OF ANTHOTHRIPS

I. Postocular spines wanting; antennae almost uniformly brown except segment 3 and base of 4, which are light brown.—*A. niger* Osborn.

II. Postocular spines well developed.

a. Postocular spines and most of those on the posterio-lateral margin of abdominal segments knobbed.

b. Total length 2.2 mm.; only the base of antennal segment 3 yellow; wings with 10-12 hairs of a second row. *A flavipes* Jones.

bb. Total body length 1.5 mm.; antennal segments 3-5 yellow; 7 hairs of a second row present. *A. dozieri* n. sp.

aa. Posterior and abdominal spines not knobbed.

b. Apex of femora with a small anteriorally directed triangular tooth within; antennae uniformly brownish-black.
—*A. nigricornis* Jones.

bb. Apex of femora without such tooth.

c. Segments 3-6 of antennae bright yellow, abdominal spines (except those of the tube) slender and rather faint.
—*A. verbasci* Osborn

cc. Segments 3-6 of antennae light brown, abdominal spines stout and conspicuous.—*A. Variabilis* Crawford.

ccc. Only segment 3 of antennae wholly bright yellow; abdominal spines short and inconspicuous.
—*A. floridensis* Watson

31. *Anthothrips verbasci* Osborn. (Redescribed by Hinds '02.) (THE MULLEIN THRIPS.)
Quincy, on corn, May. (Morgan, '13.)

32. *Anthothrips floridensis* Watson. ('16.) (THE FLORIDA ANTHOTHRIPS.)
Gainesville, April 22, 1914, on maize.

33. *Trichothrips amplipennis* Morgan. ('13, p. 33.)
Quincy, May 15, 1910. On *Hypericum solabriforme.* (G. A. Runner and A. C. Morgan). (Morgan, '13.)

34. *Trichothrips terminalis,* Hood & Williams ('15).
Orlando, collected from stump of a tree, Nov. 15, 1914, by C. B. Williams.

35. *Trichothrips fuscus* Morgan ('13, p. 36).
Quincy, May 21, 1910, swept from Spice-bush (Morgan, '13).

36. *Symphyothrips punctatus* Hood & Williams ('13).
Orlando, Jan. 21, 1913. Collected in body of orange tree by W. W. Yothers.

37. *Acanthothrips magnafemoralis* Hinds ('02, p. 199). (BIG-LEGGED THRIPS.)
Miami, Hinds '02. Type locally. "Food plant unknown." "Under bark of various trees and in dried leaves." North to Massachusetts and Illinois. (Hood, '17).

38. *Cephalothrips yucca* Hinds ('02, p. 194). (THE YUCCA THRIPS.)
Quincy, May 1910, on Yucca (Morgan, '13).
Extends north to Massachusetts and South to Barbadoes. (Hood, '17.)

39. *Cryptothrips floridensis* Watson ('13). (THE CAMPHOR THRIPS.)
Satsuma the original locality, Nov. 1912. W. O. Richtman collector. On camphor at all seasons, Glen St. Mary, Tampa, St. Petersburg, Lakeland, Macclenny. This would seem to be an introduced species, as it is not found in many localities in Florida. It has recently been found in Alabama and New Orleans, always on camphor. The writer has received specimens from Ceylon.

40. *Cryptothrips pini* Watson ('15). (THE PINE THRIPS.)
Gainesville, March, May, 1914. Common on pine trees among the needles.

41. *Cryptothrips citri,* n. sp.

FEMALE. *Measurements.* Total length 1.4 mm. Head, length, 0.16 mm., width 0.14 mm.; prothorax, length, 0.17 mm., width (including coxae), 0.28 mm.; abdomen, greatest width 0.27 mm.; tube, length 0.12 mm., width at base 0.053 mm., at apex 0.033 mm.; antenna, segment 1, 22; 2, 42; 3, 50; 4, 53; 5, 44; 6, 41; 7, 41; 8, 28 microns. Total 0.32 mm.

Color brown,, tibiae, tarsi, and third antennal segments yellowish-brown.

Head rounded in front; widest immediately behind the eyes and converging slightly behind; sides slightly convex; surface smooth; postocular spines moderately stout, about 50 microns long, knobbed. *Eyes* medium sized, orange by reflected light, black by transmitted light in balsam mounts; facets large. *Ocelli* yellow; the anterior facing obliquely upward; the posterior pair widely separated, contiguous with the margins of the eyes about .4 of the distance from the anterior ends. *Mouth cone* very broad at base, a little broader than the posterior end of the head, about .6 as long as broad, very rounding at the apex, not reaching the middle of the prothorax.

Antennae 8-segmented, nearly 1.5 times as long as the head. Segment 1 and base of 2 concolorous with the head, apex of 2 and segments 4 to 8 light brown, 3 yellow. Spines and sense cones short and light in color, inconspicuous.

Prothorax triangular in outline, the posterior angles very rounding, each bearing a moderately long, knobbed, light-colored spine. On each

side there is a somewhat longer spine and on each anterior angle a shorter one.

Metathorax a little norrower than the prothorax; sides converging posteriorly; destitute of conspicuous spines. *Legs* of medium length. Fore femora considerably enlarged. Legs provided with a few short hairs. *Wings* reaching tip of abdomen. Fore pair constricted in the middle. fringed with long hairs; near the apex are three or four hairs of a second row.

Abdomen, first three segments destitute of conspicuous spines but posterior segments bear progressively longer ones and the last segment a pair of very long but pale ones. Tube rather small.

Described from three specimens collected at Fruitland Park, Fla., in Nov. 1916, under the loose bark of a citrus tree. This tree was affected with gummosis, a bark disease, and the bark was hanging in loose flakes. The insects were found under these flakes. Type in the author's collection.

Males unknown.

KEY TO NORTH AMERICAN SPECIES OF CRYPTOTHRIPS

I. Antenna 8-segmented.

a. With prominent post-ocular spines.

b. Color uniformly black except the tarsi which are blackish brown; body length about 2.22 mm. .....*C. carbonarius.*

bb. Body color dark yellowish brown. Post-ocular spines knobbed.

c. About 1.7 mm. long. Head twice as long as wide. A dark spot behind each ocellus. Antennal segment 3 much shorter than 4 .....*C. salicis* Jones.

cc. About 1.4 mm. long. Head little longer than wide. Without dark spots behind each ocellus. Antennal segment 3 nearly as long as 4 .....*C. citri* n. sp.

aa. No post-ocular spines. Color dark brown to coal black.

b. Antenna black but segment 3 with two brownish yellow bands. Body length about 2.7 mm. *C. rectangularis* Hood.

bb. Antennal segments 3 to 6 clear yellow, 8 and tip of 7 yellowish-brown. Body length about 1.9 mm.
C. floridensis Watson

bbb. Antennal segment 3 brownish yellow; others brown, darker at tip. Body 1.7 mm. Antenna 7-segmented.
C. junctus Hood.

42. *Barythrips sculpticauda* Hood & Williams ('15).
Orlando Nov. 5, 1914. Collected from a pine stump by C. B. Williams.

43. *Letpthothrips mali* Fitch. (THE BLACK GARDEN THRIPS.)
(Cryptothrips aspersus, Hinds '02. *Phyllothrips aspersus* Hood '08., *Leptothrips aspersus*, Hood '09).
Quincy, on magnolia, beans, coffee-bean, cotton, *Cersis*, etc. (Morgan, '13.)

Orlando, "All times of the year on citrus foliage." (Back, '12.)
Key West, "Miscellaneous collecting." Runner & Morgan. (Morgan, '13.)
Gainesville, on leaves of citrus at all seasons, radishes, Nov. 19, 1914; mustard and turnips, Jan. 1915; abundant on avocados 1915. On grasses. Our most common black Thrips.
Extends north to Massachusetts; west to California and South to Panama and Barbadoes. (Hood, '17.)

44. *Haplothrips* (?) *bellus*, Hood & Williams ('15).
Orlando, Nov. 8, 1914, on rushes.
Leesburg, Nov. 16, 1914, "From grasses at edge of canal".
Emeralda, Nov. 17, 1914, on rushes. All collected by C. B. Williams.

45. *Haplothrips statices* Holiday.
"Florida" (Hood, '17).
Extends north to New York and Michigan and west to California and Oregon.

46. *Zygothrips bicolor* Hood & Williams ('15).
Orlando, Nov. 5 to 8, 1914, from Spanish moss on pine tree, on bamboo, on rushes. E. B. Williams, collector.
Emeralda, Nov. 17, on rushes. E. B. Williams, collector.

47. *Phloeothrips raptor* Crawford ('10).
Quincy, "Miscellaneous collecting." (Morgan, '13.)

48. *Phloeothrips floridensis* Watson ('13).
Gainesville, under bark of citrus in greenhouse. Jan. 1913.

KEY TO NORTH AMERICAN SPECIES OF PHLOEOTHRIPS

I. Postocular spines long and conspicuous.
  a. Segment 3 of antennae longer than 1 and 2 together; body color dark reddish brown; antennae light brown.
    b. Head nearly 1.3 times as long as wide; antennae 1.3 as long as head; segment 3 more than 1.5 times as long as 1 and 2 together ..... *P. jennei* Jones.
    bb. Head slightly more than 1.3 times as long as wide; antennae 1.5 times as long as head; segment 3 about 1.1 times as long as segment 1 and 2 together; males with teeth at apex of fore femora. ..... *P. armiger* Jones
  aa. Segment 3 of antennae shorter than 1 and 2 together; antennae mostly brown or with only the bases of segments 3 to 7 yellow.
    b. General color yellowish brown, with considerable irregular red hypodermal pigmentation; antennae twice as long as the head or nearly so. Cheeks slightly arched.
      c. Legs grayish brown; body length 1.68 mm.; postocular bristles knobbed; mouth cone reaching across prothorax ..... *P. pergandei* Hinds.
      cc. Femora brownish yellow; tibiae and tarsi yellow; body length 2.5 mm.; poctocular bristles not knobbed; mouth cone reaching two-thirds the distance across phothorax ..... *P. floridensis* Watson

bb. General color brown; fore tibiae and all tarsi light brown; cheeks strongly arched; antennae 1.5 times as long as the head. ..... *P. raptor* Crawford.

bbb. General color dark brown, tibiae and tarsi bright yellow; cheeks nearly straight; antennae 1.75 times as long as head. ..... *P. uzeli* Hinds.

II. Postocular spine wanting; general color dark mahogany brown, with many small white pigmental markings along head, thorax, abdomen and legs. ..... *P. maculatus* Hood

49. *Liothrips flavoantennis* Watson ('16). (YELLOW-HORNED THRIPS.)
Gainesville, Fla., April 23, 1914. On wild grape.

50. *Liothrips caryae var. floridensis* Watson ('16). (THE HICKORY-GALL THRIPS.)
Gainesville, Fla., May and June 1914-16. In galls of *Phylloxera* on hickory.

51. *Gynaikothrips useli* Zimmerman. (THE CUBAN LAUREL THRIPS.)
(Mesothrips ficorum, Marchal, *Liothrips bakeri* Crawford.)
Key West on *Ficus* (Russell, Bur. Ent. Bull. 99).
Miami, Fla., Wilmon Newell. A severe pest.

52. *Anophothrips megaceps* Hood and Williams ('15.).
Emeralda, Fla., Nov. 17, 1914, E. B. Williams, collector.

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A PARTIAL LIST OF THE DIURNAL LEPIDOPTERA INDIGENOUS TO FORT MYERS, EXCLUSIVE OF THE HESPERIDAE

By SHIRLEY B. WALKER

Papilio ajax, Linn., Var. *floridensis*, Holland.
Papilio ajax, Linn., Var. marcellus, Boisd.
Papilio asterias, Fab.
Papilio cresphontes, Cramer.
Papilio palamedes, Drury.
Papilio philenor, Linn.
Papilio troilus, Linn.
Papilio turnus, Linn.
Pipilio turnus, Linn., Dimorphic♀, *glaucus*, Linn.
Catopsilis agarithe, Boisd.
Catopsilis eubule, Linn.
Catopsilis eubule, Linn., Albino Form.
Terias lisa, Boisd.-Lec.
Terias nicippe, Cramer.
Anosia berenice, Cramer.
Anosia plexippus, Linn.
Basilarchia floridensis, Strecker.
Lycaena ammon, Lucas.
Lycaena hanno, Stoll.
Lycaena marina, Reakirt.
Lycaena theonus, Lucas.
Thecla melinus, Hubner.
Anartia jatrophae, Linn.
Grapta interrogationis, Dimorphic Form—*umbrosa*, Lintner.
Chlorippe alicia, Edwards.
Neonympha phocion, Fab.
Neonympha sosybius, Fab.
Pyrameis huntera, Fab.
Pyrameis atalanta, Linn.
Junonia coenia, Hubner.
Junonia genoveva, Cramer.
Dione vanillae, Linn.
Euptoieta claudia, Cramer.
Heliconius charitonius, Linn.
Pieris monuste, Linn.
Eunica sp. (probably tatila).
Nathalis iole, Boisd.

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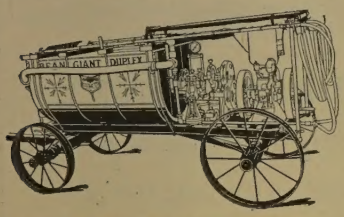

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